

WHAT IS CLAIMED IS:

Claim 1. A system for providing a plurality of different combinatorial catalyst materials, each for subsequent evaluation in a predetermined operation comprising:

a physical vapor deposition apparatus including a sealable chamber having an access means, the chamber including a plurality of separately controllable plasma sources and at least one substrate having an area thereon to which the plasma is directed from a plasma source, at least one of the plurality of separately controllable plasma sources comprising more than one plasma gun arranged in a cluster, each gun in the cluster focused toward the substrate;

the at least one substrate being controllably positionable within the chamber such that separate areas defined upon the surface of the substrate are selectively capable of being individually aligned with respect to each of the plurality of separately controllable plasma sources;

a means for controlling the plasma sources and the substrate such that each separate area defined upon the substrate may be sequentially aligned with respect to each plasma source according to predetermined parameters that determine the exposure of the area to one or more than one of the controllable plasma sources.

Claim 2. The system of claim 1 in which the means for controlling the plasma sources comprises a controlling table determining for a specified flux of plasma power and time the characteristics of the material deposited by the plasma source upon the substrate.

Claim 3. The system of claim 1 in which the substrate is positioned with respect to a rotator mechanism centrally disposed within the chamber such that the substrate can be sequentially directed separately to one or more clusters of plasma sources in the chamber.

Claim 4. The system of claim 3 in which each plasma source is focused with respect to a position correlated to the surface of the substrate when the substrate is directed toward the plasma source.

Claim 5. The system of claim 2 or claim 3 or claim 4 in which the approximate focus of each plasma source and the approximate transverse center of the substrate are each maintained within the chamber in approximately the same plane.

Claim 6. The system of claim 3 or claim 4 in which the substrate is centrally positioned within the chamber and is moveable with respect to a program controlled x-y table such that the separate areas defined upon the surface of the substrate are positioned by control means for the x-y

table in essential alignment with the focus of the one or more than one of the plasma sources.

Claim 7. The system of claim 3 in which each plasma source is positioned within the chamber at a same distance from the coating spot..

Claim 8. The system of claim 5 in which the substrate includes a plurality of separately defined areas arranged in columns and rows in a matrix.

Claim 9. The system of claim 5 in which the relationship of the number of areas in the rows to the number of areas (N) in the columns is $rows_N = columns_N$.

Claim 10. The system of claim 6 in which the relationship of the number of areas in one column to of the number of areas in an adjacent column is areas in column $_N = N$ and areas in column $N+1 = N+1$.

Claim 11. The system of claim 6 in which the relationship of the number of areas in one row to of the number of areas in an adjacent row is areas in row $_N = N$ and areas in row $N-1 = N-1$.

Claim 12. The system of claim 1 in which the plasma sources are controlled such that the materials originating from the sources are

deposited on an area of the substrate in at least one of 1) a layer by layer deposition and 2) a co-deposition relationship.

Claim 13. A substrate holder for the system of claim 1 comprising a block having a multiplicity of longitudinally extending substrates maintained in an array of columns in the block in which an upper surface of the substrate is exposed to the ions directed from the sources.

Claim 14. The holder of claim 11 in which upper surface of the substrate is inset within the block such that the cross-section area of an opening in the upper surface of the column in the block in which the substrate is positioned is less than the transverse cross-section area of the upper surface of the substrate exposed to the ions directed from the sources.

Claim 15. The system of claim 1 in which the means for controlling the sources of different ions includes programmed means for selecting one or more than one of at least: 1) means for selecting a plasma source within a cluster; 2) means for controlling the power and the duration of operation of the source; and 3) means for positioning the substrate such that a selected area of the substrate is exposed to the plasma source for the duration of operation determined.

Claim 16. The system of claim 15 in which the means for selecting a plasma source and the means for controlling the power and the duration

of operation of the source includes means for controlling the sources in essentially the same operation such that plasma materials from the sources are co-deposited with respect to an area on the surface of the substrate.

Claim 17. The system of claim 15 in which the means for selecting a plasma source and the means for controlling the power and the duration of operation of the source includes means for controlling the sources in essentially the same operation such that plasma materials from the sources are deposited as layers with respect to an area on the surface of the substrate.